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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/658,984	09/10/2003	Gary L. Jahns	44500-00342	3965
25231	7590	01/25/2005	EXAMINER	
MARSH, FISCHMANN & BREYFOGLE LLP 3151 SOUTH VAUGHN WAY SUITE 411 AURORA, CO 80014			WASHBURN, DOUGLAS N	
			ART UNIT	PAPER NUMBER
			2863	

DATE MAILED: 01/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

10/658,984

Applicant(s)

JAHNS ET AL.

Examin r

Douglas N Washburn

Art Unit

2863

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 19-43 is/are allowed.
- 6) ☒ Claim(s) 1-6 and 15-18 is/are rejected.
- 7) ☒ Claim(s) 7-14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>18 May 2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1 The drawings are objected to because figures 1, 3A, 3C, 3D,A and 4B contain some handwritten annotations and some handwritten indices . Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2 The abstract of the disclosure is objected to because it exceeds 150 words. Correction is required. See MPEP § 608.01(b).

Claim Objections

3 Claims 7-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 102

4 The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Angell et al. (US 5,658,423) (Hereafter referred to as Angell).

Angell teaches:

Obtaining sensor data corresponding to a plurality of product units being processed in accordance with the industrial process in regard to claim 1
(e.g.; column 4, lines 53-67; figure 2A, element 10);

Forming a sample matrix of data representing at least two of the product units, wherein the sample matrix is formed from at least a portion of the sensor data in regard to claim 1
(e.g.; column 5, lines 52-54; figure 2A, element 20);

Computing a plurality of singular vectors of the sample matrix in regard to claim 1
(e.g.; column 5, lines 56-60; figure 2A, element 20);

Reducing the plurality of singular vectors to a principal set of singular vectors in regard to claim 1
(e.g.; column 6, lines 6-7; figure 2A, element 50);

Computing principal components of sensor data corresponding to at least one additional product unit processed subsequent to the product units represented in the sample matrix in regard to claim 1
(e.g.; column 7, lines 8-11; figure 2A, element 50);

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Computing a predicted data vector for the additional product unit in regard to claim 1

(e.g.; column 7, lines 21-26; figure 2A, element 70);

Calculating a residual data vector for the additional product unit using the predicted data vector for the additional product unit and a measured data vector corresponding to the additional product unit, the measured data vector comprising sensor data obtained for the additional product unit in regard to claim 1

(e.g.; column 7, lines 34-43; figure 2A, element 90);

Calculating a scalar metric from the residual data vector for the additional product unit in regard to claim 1

(e.g.; column 7, lines 65 et seq; column 8, line 1);

Categorizing the additional product unit based on the value of the scalar metric in regard to claim 1

(e.g.; column 8, lines 1-6);

An industrial process comprises a plasma process and wherein the product units comprise semiconductor wafers in regard to claim 2

(e.g.; column 8, lines 1-6);

Sensor data comprises OES data in regard to claim 3

(e.g.; column 1, lines 33-36);

Sensor data comprises at least one of mass spectrometer data, electrical sensor data, and RIF sensor data in regard to claim 4

(e.g.; column 1, lines 33-36);

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Selecting, for each product unit, a single sensor data vector corresponding to a time of interest in regard to claim 5

(e.g.; column 5, lines 61-67);

A time of interest corresponds to an endpoint of an industrial process performed on product units in regard to claim 6

(e.g.; column 8, lines 59-64; figure 8);

Performing a singular value decomposition on the sample matrix to obtain the plurality of singular vectors in regard to claim 15

(e.g.; column 5, lines 56-61);

Calculating a residual data vector for the additional product unit comprises subtracting the predicted data vector for the additional product unit from the actual data vector corresponding to the additional product unit in regard to claim 16

(e.g.; column 7, lines 21-38; figure 2B, elements 60-90);

Calculating a scalar metric from the residual data vector for the additional product unit is performed in real time as product units are undergoing the industrial process in regard to claim 17

(e.g.; column 7, lines 16-43; figure 2B, elements 60-90);

And outputting on an output device at least one of the scalar metric and the category assigned to the additional product unit in regard to claim 18

(e.g.; column 7, lines 59-60; figure 1, element 50; figure 4).

Allowable Subject Matter

5 The following is an examiner's statement of reasons for allowance:

Claim 7 recites, in part, "averaging, for each product unit, a plurality of sensor data vectors to obtain one average sensor data vector corresponding to each product unit". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 8 recites, in part, "only data vectors obtained after a predetermined time from a start point of the industrial process preformed on the product unit up to a predetermined time before an endpoint of the industrial process performed on the product unit are averaged". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 9 recites, in part, "updating the sample matrix by deleting from the sample matrix sensor data corresponding to at least one product unit obtained earlier in time and adding to the sample matrix sensor data corresponding to at least one product unit processed later in time; and periodically recomputing the singular vectors of the sample matrix; and periodically reducing the singular vectors to a set of principal singular vectors". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 10 recites, in part, "assigning the additional product unit to a third category if the scalar metric is within a third range". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 11 recites, in part, "calculating the standard deviation of the residual data vector". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 12 recites, in part, "normalizing the standard deviation by an average standard deviation to obtain a normalized standard deviation corresponding to the additional product unit". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 13 recites, in part, "assigning the additional product unit to a first category if the normalized standard deviation corresponding to the additional product unit is less than a first predetermined parameter; assigning the additional product unit to a second category if the normalized standard deviation corresponding to the additional product unit greater than or equal to the first predetermined parameter and is less than a second predetermined parameter; and assigning the additional product unit to a third category if the normalized standard deviation corresponding to the additional product unit is greater than or equal to than the second predetermined parameter". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 14 recites, in part, "the value of the first predetermined parameter is 2.0 and the value of the second predetermined parameter is 3.0". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 19 recites, in part, "retrieving the model for the plasma process associated with the additional wafer; computing principal components, a predicted data vector, and a residual data vector for the additional wafer, using the principal set of singular vectors from the retrieved model". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claims 20-29 depend from claim 19.

Claim 30 recites, in part, "principal component analysis module operable to compute principal singular vectors for a sample matrix input thereto, the sample matrix and principal singular vectors thereof comprising model data, said principal component analysis module being further operable to compute, from the principal singular vectors associated with the sample matrix input thereto, principal components, a predicted data vector, and a residual data vector for each additional product unit that is processed subsequent to processing of the product units represented in the sample matrix input thereto". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claims 31-43 depend from claim 30.

It is these limitations, which are not found, taught or suggested in the prior art of record, and are recited in the claimed combination that makes these claims allowable over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

6 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas N Washburn whose telephone number is (571) 272-2284. The examiner can normally be reached on Monday through Thursday 6:30 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E Barlow can be reached on (571) 272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DNW



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